THE
SERVICE STANDARDS
PROGRAM

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TORONTO TRANSIT COMMISSION

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EXECUTIVE SUMMARY

PREFACE

In August 1977, the Commission adopted a report, entitled "Standards for Evaluating Existing and Proposed Routes", which outlined its then-current service evaluation procedures. In subsequent years, continuing research has resulted in numerous refinements which have been tested and applied in the annual Service Standards applicati[illegible] undertaken between 1978 and 1983. This report is an updated version of the 1977 "Base Document" and incorporates all such refinements.

I. INTRODUCTION

The Service Standards Program consists of three main processes:

- Ongoing monitoring and service adjustments for all existing routes;
- An annual evaluation of the economic and ridership performance of all existing routes and a concurrent comprehensive evaluation of municipal and TTC staff-generated proposals for new and modified services; and
- An evaluation of new and modified services which had been implemented as a result of the previous year's Service Standards application.

These evaluative processes are applied systematically, consistently and objectively to all services, existing and proposed, throughout Metropolitan Toronto.

II. DESIGN GUIDELINES FOR EXISTING AND PROPOSED NEW SERVICES

A set of design guidelines is used in the ongoing evaluation and modification of existing routes and in the preliminary evaluation and design of proposed new services. The guidelines are important to these processes because they maximize the attractiveness of services to the rider, ensure consistency of route structure, and provide objective and consistent criteria for the setting of service levels.

The major Design Guidelines stipulate that:

- surface routes conform to the grid system of major arterial roads;
- the interconnection of surface routes with rapid transit lines be maximized; and
- only one route be operated on each major arterial roadway or on closely-spaced parallel roadways.

Other Design Guidelines deal with route diversions, operational feasibility, stop locations, vehicle loading standards, minimum service levels and blended headways.

III. MONITORING OF EXISTING SERVICES

A two-part process is used to ensure the effectiveness and efficiency of all existing routes in the system.

Ridership Monitoring and Service Adjustment Program

Ridership on all regular routes is monitored through regular and frequent counts. If maximum-hour peak-point average vehicle loads begin to exceed the applicable loading standards,

then additional service is provided, subject to vehicle and budgeted mileage availability. If actual average vehicle loads are beginning to drop significantly below the applicable loading standard, then service levels may be decreased accordingly.

Annual Performance Review

Each year, all existing routes are ranked in descending order according to their Revenue/Cost Ratio and Daily Average Occupancy. Routes which fall within the bottom quartile of both rankings, have not recently undergone substantial service modifications and are not included as part of other ongoing Commission studies, are designated "poor-performing" routes. Poor performing routes are examined in order to identify measures which could be taken to improve their performance. Routes for which no such service change is feasible are then required to undergo Comparative Evaluation with certain new service proposals.

IV. EVALUATION OF SERVICE PROPOSALS

Each year's Service Standards application includes a comprehensive evaluation of municipal and TTC staff-generated proposals for new and modified transit services.

Proposals for New Services

All proposals for new services must conform to the System Design Guidelines and benefit residents and workers who lie

beyond 300 metres (1,000 feet) of an existing service in order to be analyzed.

Before proceeding with analysis of a proposal which would involve substantial costs to the Commission, staff explore alternatives which could satisfy the request as a "minimal cost solution" (i.e. one which requires no additional vehicles or mileage). If a minimal cost proposal is available which conforms to the Design Guidelines and confers a net benefit on existing and potential riders, it can usually be recommended for implementation, subject to municipal review.

If a minimal cost solution cannot be found, then a substantial cost solution is formulated and evaluated under Comparative Evaluation, together with the poor-performing existing routes.

Comparative Evaluation

All services designated for Comparative Evaluation are evaluated and ranked with respect to five measures:

- Change in Accessibility Measurement Factor (an indicator of the average reduction in walking and waiting times to transit);
- Change in Aggregate Accessibility per Weekday Cost (an indicator of the walking and waiting time reduction achieved per dollar spent);
- New Ridership per Weekday Cost;
- Marginal Revenue/Cost Ratio; and
- Transit Dependency.

Each route's position in each of these five rankings is used to calculate its overall ranking.

Routes may then be recommended for implementation, subject to vehicle and budgeted mileage availability, starting with the most highly-ranked routes and proceeding until the available vehicles and/or mileage have been assigned. If a proposed new service is ranked higher than an existing poor-performing route, then discontinuation of the poor-performing route could be recommended.

Other Proposals for New or Modified Services

Criteria have been developed to evaluate proposals for three categories of service changes:

- Additional Periods of Operation on Existing Routes;
- Additional Individual Trips on Existing Routes; and
- Improved Frequency of Service on Existing Routes.

Miscellaneous Proposals

Municipal proposals which do not fall into any of the aforementioned categories are dealt with individually, in the most appropriate manner - often outside the formal Service Standards Program.

V. SIX-MONTH REVIEW OF NEW AND MODIFIED SERVICES

All approved service changes are implemented for a six-month trial period. If ridership after six months is at least

85% of the projected "mature state" level, then the service is confirmed as permanent. If not, the service is re-evaluated on the basis of its actual ridership, in order to determine if it still would have qualified for implementation. If it fails this further review, cancellation of the service will be considered.

VI. CONTINUED DEVELOPMENT OF THE SERVICE STANDARDS PROGRAM

Prior to the publication of the next edition of this Base Document, research will continue in order to find improved means for evaluating and designing transit services. Some of the areas being investigated for possible inclusion in the next edition include the following:

- Express Services
- All Night Services
- Productivity Measures;
- Clockface Headways;
- Service Reliability;
- Timed Transfers;
- Route Amalgamations; and
- Permanent Route Diversions.

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PREFACE

In January 1976, the Toronto Transit Commission recognized the need to expand and formalize its route monitoring and evaluation procedures and instructed its staff to report on standards or criteria that could be used to compare the relative performance and financial results of individual routes in the existing system. At that time, Commission staff were already studying more effective means to estimate ridership and to establish priorities for proposed new routes and extensions of existing ones. Because the two studies had similar objectives and involved much of the same methodology, they were combined into one project.

In January 1977, a report entitled "Policies for Discussion: Standards for Evaluating Existing and Proposed Routes" was released by the Commission. This report was designed to provide a framework for discussion and consultation with Metropolitan Toronto and the local municipalities, community groups and the Province of Ontario.

Based on the results of the subsequent discussions with these groups, a final report entitled "Standards for Evaluating Existing and Proposed Routes" was considered and adopted by the Commission in August 1977. The objectives of this report, also known as the original "Service Standards Base Document", can be summarized as follows:

1) To outline explicit policies that assist in establishing a consistent rationale for the level of transit service throughout Metropolitan Toronto;
2) To provide objective and precise methodologies which permit regular and thorough review of existing service on a route by route basis, to ensure the most efficient and effective use of limited resources;
3) To outline a comprehensive means of assessing proposed new services, thus permitting a definitive and open evaluation of future transit needs; and
4) To permit the comparison of existing routes with proposed new ones, by ensuring that the methods used to evaluate both are compatible.

It was noted in the report that the development and application of service evaluation procedures is an evolutionary process which would change in response to changes in demographic trends, urban development patterns and other factors which affect the demand for transit service.

In subsequent years, continuing research has resulted in numerous refinements to the service evaluation procedures established in the 1977 Base Document and these refinements have been tested and applied in the annual Service Standards applications during the period 1978 to 1983. The major changes which have been introduced since 1977 are as follows:

1) Existing routes are ranked annually according to their revenue/cost ratio rather than their net revenue per mile;

2) Proposed new services are no longer required to pass the former accessibility and net revenue "filtering points" in order to be eligible for Comparative Evaluation (although accessibility and marginal revenue/cost ratio are still considered in the calculation of their final comprehensive ranking);
3) A more precise method of measuring access to transit has been developed, based on actual walking and waiting times to transit;
4) The ridership projection method has been significantly improved, making use of current Metro Toronto travel data;
5) Revenue projection methods for new services and service modifications have been standardized;
6) A more comprehensive overall assessment procedure has been developed, in order to determine if a proposed new service should be implemented;
7) "Operational Feasibility" has been formally designated as a System Design Guideline;
8) Vehicle loading standards have been developed for articulated and Orion (30-foot) buses and revised for streetcars;
9) A new vehicle loading standard has been established for off-peak services operating on headways of 10 minutes or less;

10) Evaluation criteria have been developed for the six-month review of all new and modified services;

11) Schedule Design Guidelines have been developed for blended headways; and

12) Criteria have been developed to evaluate proposals for additional periods of operation or additional trips on existing routes.

Although research on all of the evaluation methods and techniques continues on an ongoing basis, the changes outlined above are significant enough to warrant the publication of a new "Base Document". The purpose of this report is to explain the Commission's current service evaluation procedures and to encourage broader public and transit industry understanding of them.

PART I - INTRODUCTION

The Service Standards Program consists of three main processes (see Figure 1):

1) Ongoing monitoring and service adjustments for all existing routes, in order to ensure that such services are always designed to accommodate demonstrated user demand. This process is performed continually by Commission staff.

2) An annual evaluation of the economic and ridership performance of all existing routes and a concurrent comprehensive evaluation of municipal and TTC staff-generated service proposals. This process affords the local municipalities within Metropolitan Toronto the opportunity to submit council-endorsed proposals for new services. The requirement for council endorsement of all such proposals is meant to ensure that they have broad community support and to provide the Commission with a mandate to evaluate them together with any TTC staff-generated proposals. Any recommended service change must subsequently be reviewed by the appropriate municipal council before it can actually be implemented (subject to operational feasibility and the availability of vehicles and budgeted mileage).

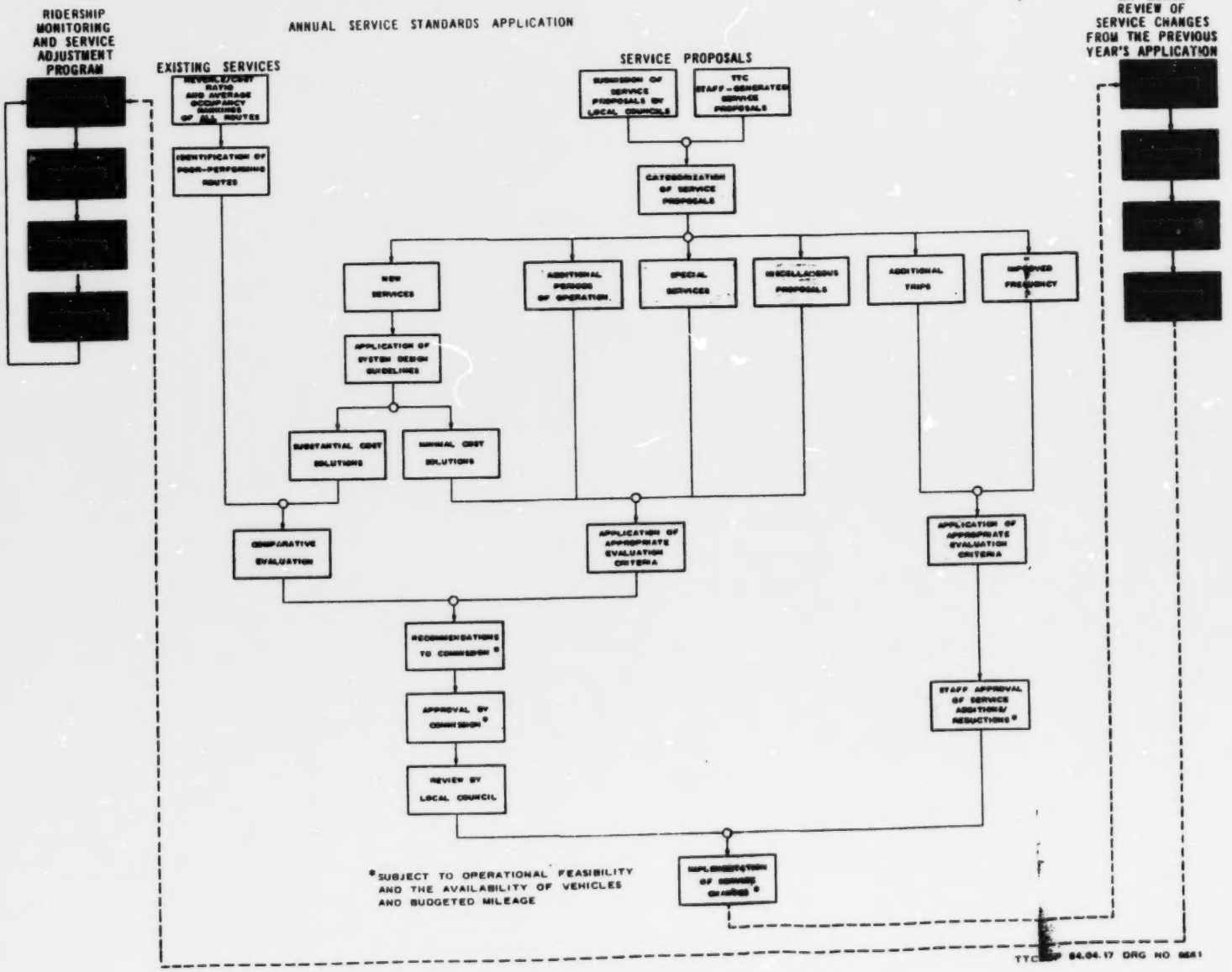
3) An evaluation of new and modified services which had been implemented as a result of the previous year's Service Standards application. Any service which is implemented under the Service Standards Program is operated on a trial basis for six months, after which time its performance is

reviewed and a decision regarding its future (including possible modification or elimination) is made.

Throughout the Service Standards Program, the evaluation of all services (existing and proposed) is carried out primarily on a comparative or relative basis. This approach permits system planning and modifications to be undertaken with the assurance that the Commission's limited resources are being used in an ever-increasingly efficient and effective manner.

The evaluative processes which are outlined above, and described in the text which follows, are applied systematically, consistently and objectively to all services, existing and proposed new ones, throughout Metropolitan Toronto. More detailed information on specific evaluation techniques is available from Commission staff on request.

OVERVIEW OF THE SERVICE STANDARDS PROGRAM


RIDERSHIP MONITORING AND SERVICE ADJUSTMENT PROGRAM
ANNUAL SERVICE STANDARDS APPLICATION
EXISTING SERVICES
SERVICE PROPOSALS
SIX-MONTH REVIEW OF SERVICE CHANGES FROM THE PREVIOUS YEAR'S APPLICATION
IDENTIFICATION OF POOR-PERFORMING ROUTES
CATEGORIZATION OF SERVICE PROPOSALS
NEW SERVICES
ADDITIONAL PERIODS OF OPERATION
SPECIAL SERVICES
ADDITIONAL TRIPS
APPLICATION OF SYSTEM DESIGN GUIDELINES
SUBSTANTIAL COST SOLUTIONS
MINIMAL COST SOLUTIONS
COMPARATIVE EVALUATION
APPLICATION OF APPROPRIATE EVALUATION CRITERIA
RECOMMENDATIONS TO COMMISSION *
APPROVAL BY COMMISSION *
REVIEW BY LOCAL COUNCIL
STAFF APPROVAL OF SERVICE ADDITIONS/ REDUCTIONS *
* SUBJECT TO OPERATIONAL FEASIBILITY AND THE AVAILABILITY OF VEHICLES AND BUDGETED MILEAGE

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PART II - DESIGN GUIDELINES FOR EXISTING AND PROPOSED NEW SERVICES

1. INTRODUCTION

The Commission has developed a set of design guidelines which are used both in the ongoing evaluation and modification of existing routes and in the preliminary evaluation and design of proposed new services. The guidelines are important to these processes for three reasons: they maximize the attractiveness of services to the rider, ensure consistency of route structure for existing and new services, and provide objective and consistent criteria for the setting of service levels on all routes within the system. These guidelines may be categorized as either System Design Guidelines or Schedule Design Guidelines, as described below.

2. SYSTEM DESIGN GUIDELINES

System Design Guidelines are used to determine the physical configuration of the total transit system and of the individual routes.

a) System and Route Configuration

The grid orientation is the most efficient means of supplying convenient service between the majority of origins and

destinations throughout the Metropolitan Toronto area, and it provides the maximum number of route combination choices for the rider. Thus, surface routes conform to, or are oriented to the grid system of major arterial roads.

b) Surface-Subway Integration

Because the subway system provides basic trunk services within Metropolitan Toronto, the interconnection of surface routes with subway stations is maximized. This policy of integration of surface and rapid transit routes will continue to be followed with the opening of other future rapid transit lines.

c) Duplication of Service

In most cases, only one route is operated on each major arterial roadway or on closely-spaced parallel roadways. However, it may be appropriate to duplicate service in certain cases where routes merge to feed a subway station, to make use of an on-street loop, to circumvent a physical barrier or to make use of reserved bus lanes.

d) Route Diversions

In general, bus routes will not be diverted off major arterial roads to serve off-route traffic generators. Such diversions usually reduce the operating efficiency of routes and inconvenience large numbers of through riders. They are also not desirable because the Commission's surface routes are, by design, based on the grid system.

e) Operational Feasibility

The Commission will operate only those services which are deemed to be operationally satisfactory. Consequently, there is a thorough operational feasibility investigation of every proposal for a new service or an extension of an existing service. This includes an inspection of the streets involved, with particular attention being given to such possible physical constraints as the compositic.. and condition of the roads, widths of paved roadways, shoulder conditions, difficult turns or grades, local traffic and parking regulations.

f) Location of Stops

When the locations of stops are being planned for a route, it is necessary to strike a balance between the competing objectives of maximum passenger convenience, optimal operating efficiency and safety. In general, increasing the number of stops on a route results in shorter walking distances to stops for passengers, but it also slows down service. In order to deal with this trade-off objectively, the following set of stop location guidelines have been developed.

On arterial roads, stop locations are first selected at major signalized intersections. Intermediate stop locations between major intersections are then selected, usually in the vicinity of major traffic generators (such as large factories and shopping centres) and at intersections with streets which penetrate the surrounding neighbourhoods. Consequently, the spacing of stops within most parts of Metropolitan Toronto may vary from

120 to 335 metres (400 to 1,100 feet), with an average of approximately 230 metres (750 feet).

In the downtown core area, however, stop spacing is often affected by conditions which are beyond the Commission's control. The larger number of signalized intersections and the presence of numerous major passenger generators tend to reduce the spacing of stops. Within the downtown area, the distance between stops may occasionally fall below the 120-metre figure mentioned above

Stop locations may be ideal from a transit standpoint, but sometimes result in complaints from local residents. It should be noted that while the Commission attempts to accommodate proposals for stop relocations, the efficiency and effectiveness of the transit operation is paramount. However, in cases where the effect on transit operations and passenger inconvenience is minimal, the Commission may accommodate such proposals.

3. SCHEDULE DESIGN GUIDELINES

Schedule design guidelines are applied to individual routings and are intended to determine appropriate scheduling and levels of service.

a) Vehicle Loading Standards

Vehicle loading standards specify the acceptable average number of passengers per vehicle (or average vehicle load) passing the peak point of a given route, during the maximum hour of a given operating period. The standards are designed to ensure passenger comfort and operating efficiency.

The frequency of service on a route is designed so that average vehicle loads do not exceed the applicable loading standard during each peak and off-peak operating period, subject to the minimum service level standards (which are described in Section II.3.b).

The following are the vehicle loading standards, for both the peak and off-peak operating periods, which are presently applied by the Commission:

ACCEPTABLE MAXIMUM-HOUR AVERAGE VEHICLE LOADS (PASSENGERS/VEHICLE)

MODE	PEAK PERIODS	OFF-PEAK PERIODS	
	All Routes	Headways of 10 min. or less	Headways of more than 10 min.
Standard (40-foot) Bus	55-65	50	40
Articulated Bus	85-95	69	55
Orion (30-foot) Bus	38-45	39	31
Trolley Coach	55-65	51	41
Streetcar			
- Mixed Traffic	70-80	58	46
- Private R-O-W	80-90	58	46
Articulated Streetcar			
- Mixed Traffic	105-115	78	62
- Private R-O-W	125-135	78	62
Subway Train	1,335	500	-

In order to account for surge loadings over short time periods and/or short distances during peak periods, a range of acceptable average vehicle loads is applied. During the off-peak periods, when the impact of this factor is not as critical, the Commission's basic policy is to operate service with, on average, fully-seated loads (i.e. with no standees). However, on routes with frequent off-peak service (i.e. headways of 10 minutes or

less), the loading standard is set at a level 25 percent higher than a seated load because a relatively high level of service is already being provided.

It should also be noted that, during peak periods, there are two separate "levels" of loading standards for both streetcars and articulated streetcars, depending on their mode of operation. The use of a higher level of loading standards for vehicles operating on their own private right-of-way (i.e. LRT operation) is justified by the different operating characteristics of such lines (fewer stops, higher operating speeds, multiple-unit operation, etc.).

b) Minimum Service Levels

The headway (or time interval between vehicles) on a given route is usually determined on the basis of demonstrated passenger demand. However, on some routes, there are certain operating periods during which passenger demand is relatively low and strict adherence to the above-noted vehicle loading standards would result in excessively wide headways. In order to ensure that a reasonable, attractive level of transit service is available on all routes during applicable operating periods, minimum service guidelines are observed by the Commission.

On surface routes, the maximum headway generally permitted is 20 minutes in peak periods and 30 minutes in off-peak periods. On the subway system, no headway wider than 6 minutes is operated.

c) Blended Headways

When multiple routes (or branches) serve a common street, it is desirable that the vehicles from the separate routes operate in an alternate-sequence pattern over that route section, and that the inter-arrival times be equal. For those riders who board and alight along the common portion, this "blending of headways" avoids long gaps between vehicles and minimizes average waiting times. Also, vehicle loads are more balanced, and service is more reliable.

If additional vehicles are not required in order to achieve blending, then blending should be instituted on any route during any time period, provided that the loading standards can be adhered to.

If additional vehicles are required in order to achieve blending, then blending should not be implemented on route sections where combined headways are below four minutes. This is because variations in traffic conditions generally do not permit the vehicles to remain evenly spaced at such small time increments and the blending has only a small impact on service. However, at headways above four minutes, blending may be instituted, even if additional vehicles are required, according to the following guidelines:

1) the length of common segment should be at least two kilometres (1¼ miles); and

2) the vehicle loads on each of the blended routes should be at least equal to the loading standards for the respective vehicle types and time periods.

The above-suggested four-minute and two-kilometre guidelines are indicators. Decisions as to blending require a full examination of each case considering such factors as the need for additional layover, the ratio of passengers benefitting/passengers inconvenienced, flexibility of scheduling and operating problems.

At the present time there are several blended routes with headways less than four minutes. Before blending would be removed from such a route, now or in the future, an analysis would be undertaken to determine if vehicle arrivals on the route were random or regular. If arrivals are regular then the blend is effective and should be retained.

PART III - MONITORING OF EXISTING SERVICES

1. INTRODUCTION

In order to ensure that rider needs are being met and that resources are being used in a most cost-effective manner, a two-part process is used for determining the effectiveness and efficiency of all existing regular routes. This process consists of: 1) regular and frequent monitoring of ridership trends and subsequent adjustment of service levels on all routes; and 2) an annual comparative analysis of route economic performance and efficiency. The two components of this process are described separately below.

2. RIDERSHIP MONITORING AND SERVICE ADJUSTMENT PROGRAM

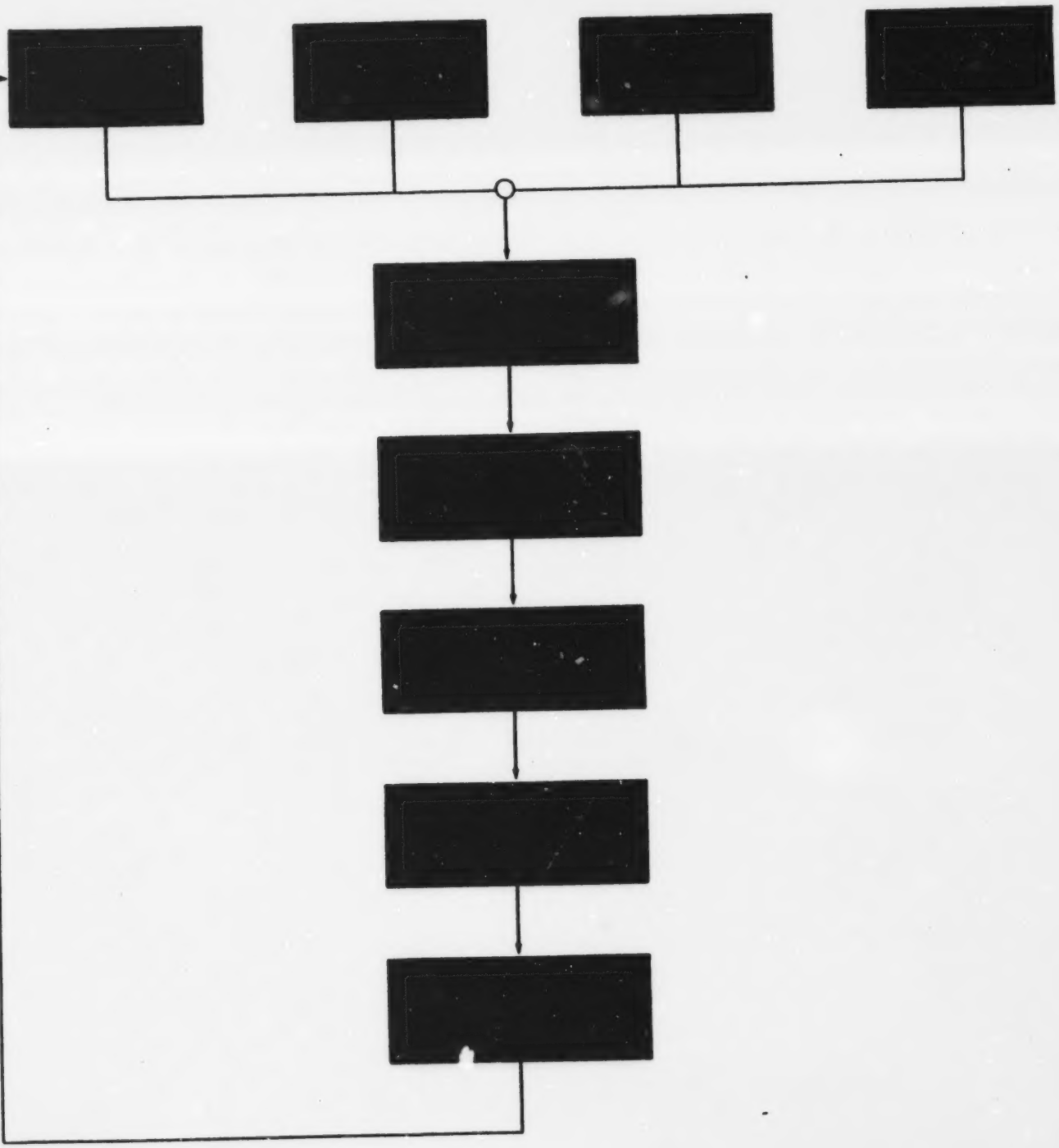
The levels of service provided on transit routes should be commensurate with demonstrated passenger demand. Therefore, ridership on all regular routes within Metropolitan Toronto is monitored by means of regular and frequent ridership counts. In addition, information and statistics are compiled from customer communications regarding daily riding experiences; from staff observation of ridership and operating characteristics on routes; and from operations reports on passenger loadings and recurring problems which may affect service to the customer (see Figure 2). Based on all of these factors, warranted adjustments to service levels are made, subject to the availability of vehicles and budgeted mileage.

In the interests of satisfying customer requirements, the most influential of the above factors in determining the need for service level adjustments is the actual average vehicle loading at the peak point on each route. If the loads for a given route are approaching or exceed the upper limit of the applicable loading standard for a given operating period (i.e. ridership is increasing), then an increase in that route's level of service is implemented, subject to vehicle and mileage availability. If, on the other hand, actual average vehicle loads are beginning to drop significantly below the applicable loading standard (i.e. ridership is decreasing), then the level of service on that route may be decreased accordingly. The same loading standards are applied objectively and systematically to all regular TTC routes throughout Metropolitan Toronto.

Generally, when service levels are adjusted, vehicles are added or removed for the duration of the operating period under consideration. However, in certain cases, the addition of one or more vehicles for a whole off-peak operating period may not be the most cost-effective approach for dealing with increased ridership on a given route. With the growing acceptance of the Variable Work Hours concept within Metropolitan Toronto, certain TTC routes have experienced significant ridership increases in the "shoulder" periods immediately preceding or following the traditional rush hour periods. In such cases, consideration is given to the extended use of one or more peak period vehicles for an additional hour or two, immediately before or after the regular rush hour period, subject to vehicle and mileage

Figure 2

THE RIDERSHIP MONITORING AND SERVICE ADJUSTMENT PROGRAM



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availability. Through the use of this more cost-efficient scheduling strategy, additional service can be provided only when it is specifically warranted, and costly over-servicing of routes for complete off-peak operating periods can be avoided.

3. ANNUAL PERFORMANCE REVIEW

While the Ridership Monitoring and Service Adjustment Program operates on a continual basis throughout the year, all existing routes are also subjected to an annual review of their economic and ridership performance. This Annual Performance Review is conducted as a component of each year's Service Standards application, and is designed to identify existing routes which are "poor performers" within the system and which require corrective action more extensive than a modest adjustment of service levels.

Each year, all existing routes in the system are ranked, in descending order, on the basis of two criteria: [1] their revenue/cost ratio (an indicator of each route's overall economic performance); and [2] their daily average occupancy (an indicator of overall passenger usage of each route). All routes which fall within the bottom quartile of both rankings are designated as "poor-performing" routes and are designated for more detailed review.

The first step in examining these poor-performing existing routes is to determine:

1) if service on any of the routes has recently been substantially modified; or

2) if any of the routes are included as part of other on-going Commission studies.

If either of the above is true, then a subject route is not analyzed further. All other poor-performing routes are then examined in detail, in order to identify measures which could be taken to improve their economic and ridership performance. Such measures may include changing the level of service provided, decreasing the hours of service, restructuring the route with introduction of a new short turn, or amalgamating the service with another existing route. If a suitable service modification can be identified for a given route, its implementation is recommended and the route is exempted from further evaluation.

Poor-performing routes which are not exempted under the above conditions and for which no such service change is feasible are required to undergo Comparative Evaluation with certain new service proposals (see Section IV.3). If, as a result of this process, a proposed new service is determined to be a more effective and efficient use of vehicles than an existing poor-performing route, then a recommendation could be made to discontinue the existing poor-performing route.

PART IV - EVALUATION OF SERVICE PROPOSALS

1. INTRODUCTION

Each year's Service Standards application provides the opportunity for Metropolitan Toronto's area municipalities to propose the introduction of new transit services or the modification of existing ones; in addition, TTC staff generate their own proposals for new services and service changes. All these service proposals are typically categorized as follows:

1) Proposals for New Services;
2) Proposals for Additional Periods of Operation on Existing Routes;
3) Proposals for Additional Individual Trips on Existing Routes;
4) Proposals for Improved Frequency of Service on Existing Routes;
5) Proposals for Special Services; and
6) Miscellaneous Proposals.

The techniques used to evaluate each of the above types of proposals are now described in turn.

2. PROPOSALS FOR NEW SERVICES

Each municipal and TTC staff-generated proposal for transit service on a section of roadway which is not currently served is classified as a proposal for a "new service". "New services" thus refer to the creation of a new and separate

transit route, to the extension or modification of an existing route, or to the creation of a new branch of an existing route.

All proposals for new services are first reviewed with respect to the System Design Guidelines (which are discussed in Section II.2). All proposed new services which would violate one or more of these guidelines are eliminated from further consideration. Additionally, any proposed new service for which the affected local residents and workers all lie within 300 metres (1,000 feet) of an existing service need not be considered further.

Next, the remaining (conforming) proposals are reviewed in order to determine whether the new service could be fulfilled with a "minimal cost" solution, or whether a "substantial cost" solution is necessary.

a) Minimal Cost Solutions

"Minimal cost" solutions are defined as those which would require neither additional vehicles nor a substantial increase in mileage. In order to maximize system cost-effectiveness and efficiency, all potential means of providing the proposed new service as a minimal cost solution are explored first.

Examples of minimal cost solutions include the splitting of service on an existing route (thus creating two or more separate branches), or the extension of an existing route with no change in the number of vehicles allocated to it (but with an overall widening of headways over the whole route). It should be noted that, in these examples, the implementation of a minimal

cost solution may necessitate some reduction in service levels for some of the current customers of an existing route. However, a minimal cost proposal can usually be recommended for implementation if it satisfies the following three conditions:

1) It is operationally feasible;
2) It will not result in a violation of earlier-mentioned vehicle loading or maximum headway standards; and
3) It will confer a net benefit on existing and potential customers (measured, for example, as number of new riders served vs. number of existing riders inconvenienced).

b) Substantial Cost Solutions

If it is not possible to develop a minimal cost solution which can adequately satisfy a proposal for new service, then "substantial cost" solutions are considered. "Substantial cost" solutions are those which require additional vehicles and/or a substantial increase in mileage. Examples of substantial cost solutions include the creation of a new and separate route, or the extension of an existing route with a commensurate increase in the number of vehicles allocated to it.

Because substantial cost solutions consume a significant amount of resources, they are subjected to a more complex and rigorous analysis, known as Comparative Evaluation. This process, which assesses the efficiency and effectiveness of proposed new routes in relation to each other and to those of the existing poor-performing routes, is described below.

3. COMPARATIVE EVALUATION

The Comparative Evaluation process provides a comprehensive evaluation of poor-performing existing routes and proposed "substantial cost" new services in order to determine which ones are the most efficient and effective use of resources (see Figure 3). The routes are evaluated and ranked with respect to five measures:

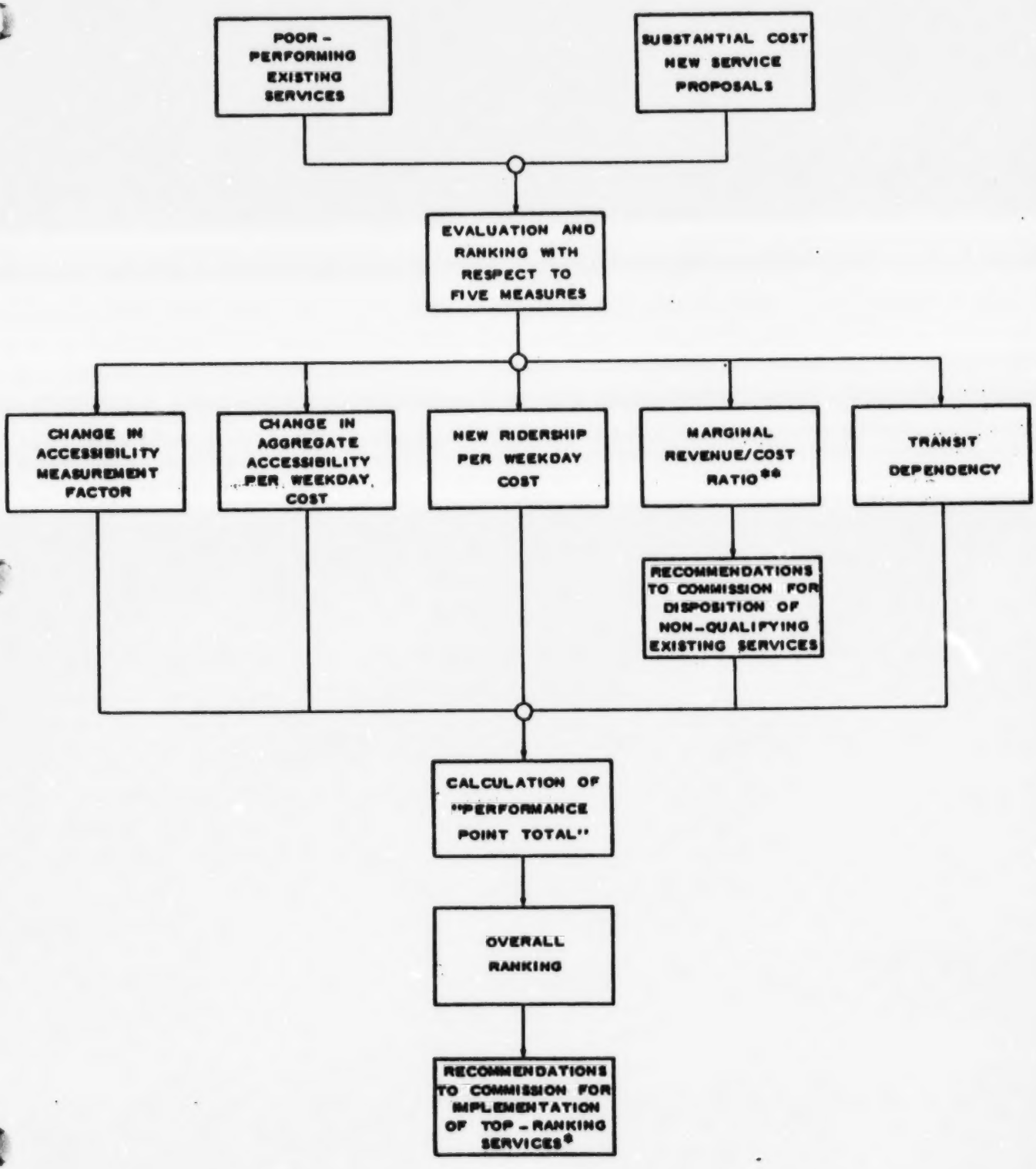
1) Change in Accessibility Measurement Factor (AMF) (expressed as person-minutes/capita): an effectiveness measure which indicates the magnitude of the average reduction in access time to transit (comprised of walking and waiting times) which the route achieves for residents who live within the catchment area (see Appendix A) of the route;

2) Change in Aggregate Accessibility per Weekday Cost (expressed as person-minutes/$): an efficiency measure which indicates the magnitude of the aggregate improvement in access to transit for residents of the route's catchment area per (weekday) dollar expended in providing this service;

3) New Ridership per Weekday Cost (expressed as new riders/$): an efficiency measure which indicates the number of <u>new</u> riders which are attracted to the route per (weekday) dollar expended in providing the service;

4) Marginal Revenue/Cost Ratio (expressed as revenue per mile/ cost per mile): an efficiency measure which indicates the (relative) economic viability of the service, based on a comparison of the marginal cost of operating that particular service

THE COMPARATIVE EVALUATION PROCESS


POOR - PERFORMING EXISTING SERVICES
SUBSTANTIAL COST NEW SERVICE PROPOSALS
EVALUATION AND RANKING WITH RESPECT TO FIVE MEASURES
CHANGE IN ACCESSIBILITY MEASUREMENT FACTOR
CHANGE IN AGGREGATE ACCESSIBILITY PER WEEKDAY COST
NEW RIDERSHIP PER WEEKDAY COST
MARGINAL REVENUE/COST RATIO**
TRANSIT DEPENDENCY
RECOMMENDATIONS TO COMMISSION FOR DISPOSITION OF NON-QUALIFYING EXISTING SERVICES
CALCULATION OF "PERFORMANCE POINT TOTAL"
OVERALL RANKING
RECOMMENDATIONS TO COMMISSION FOR IMPLEMENTATION OF TOP - RANKING SERVICES*

* SUBJECT TO OPERATIONAL FEASIBILITY AND THE AVAILABILITY OF VEHICLES AND BUDGETED MILEAGE

** DOUBLE WEIGHTING FOR THIS MEASURE

TTC OP 84.04.17 DRG NO 8563

and the marginal daily revenue collected on the route, both allocated on a per mile basis; and

5) Transit Dependency: an effectiveness measure which indicates the extent of the route catchment area population's dependency on transit.

The methods of calculating these five measures are described in detail in Appendix A.

All routes in the Comparative Evaluation process are then ranked according to their performance with respect to the above five measures. Each route's position in each of the five individual rankings determines its "Performance Point Total" for the overall (comprehensive performance) ranking as follows. For each individual measure, one point is awarded to the highest-ranking route, two points are awarded to the second-highest ranked route, and so on. Points accumulated by the routes in each of the five individual rankings are of equal importance, except for those awarded in the Marginal Revenue/Cost Ratio ranking, which are given a double weighting in order to acknowledge the significance of the economic viability of a route. The points for each route are then totalled to yield that route's overall ranking. The better a route's performance, considering all five measures, the lower will be its overall point total and the higher will be its overall ranking.

Routes in the overall ranking may then be recommended for implementation, subject to operational feasibility and the availability of vehicles and budgeted mileage, starting with the most highly-ranked routes and proceeding in descending order until the available vehicles and/or mileage have been assigned. In the

event that a proposed new service is ranked higher than an existing poor-performing route, a recommendation could be made to discontinue the poor-performing existing route.

4. PROPOSALS FOR ADDITIONAL PERIODS OF OPERATION ON EXISTING ROUTES

Service is provided on routes (and route branches) during those time periods when passenger demand is deemed sufficient to support such service. In general, when a new route is first introduced into an area, service is usually provided only during rush hours or for 12 hours a day, Monday to Friday (especially if the route is serving a developing area). However, as the route's service area develops and its ridership grows, consideration may be given to the provision of additional periods of operation, on an incremental basis only, in accordance with the following priority system for implementation (assuming that weekday rush hour service already exists):

Priority	Period of Service
1	Weekday Midday
2	Weekday Evening
3	Saturday Daytime
4	Saturday Evening
5	Sundays and Holidays (All Day)

For example, under this priority ranking, an existing route which already has weekday midday service may next be considered for implementation of weekday evening service, but Sunday and Holiday service could not be considered until after Saturday evening (and other higher-priority) services were implemented. The priority ranking may, however, be superseded for a particular route if warranted by special circumstances (such as industrial shift work

arrangements).

When a proposal is made for additional periods of operation on an existing route, the above-noted ranking system is used to determine which operating period would next be eligible for possible service. Projected ridership and revenue for the new period of operation are then calculated, based on the performance of the existing service, as described in Appendix B.

If the revenue which is projected to be generated during a new period of operation covers at least 68% of the total operating costs which would be incurred in providing the additional service, then the implementation of the service is recommended, subject to the availability of vehicles and budgeted mileage. If the 68% cost recovery criterion cannot be met in the year proposed, the proposal may be reconsidered in a subsequent year, after further development of the route's service area.

5. PROPOSALS FOR ADDITIONAL INDIVIDUAL TRIPS ON EXISTING ROUTES

In general, the specific start and finish time for daily service on each route is not standardized system-wide, but is instead determined by demonstrated passenger demand on a route-specific basis. Consequently, when a proposal is made for additional (earlier and/or later) individual trips on an existing route, that proposal is evaluated on the basis of the performance of the existing first/last trip for that route, as applicable.

More specifically, each such proposal for additional individual trips is evaluated against the following four conditions:

1) the revenue generated by the existing first/last trip should already be covering approximately 68% of that trip's total operating costs;

2) present vehicle passenger loads, at the route's peak point, on the existing first/last trip should be at least a fully-seated vehicle load:
   a) Standard (40-foot) Bus - 40 passengers
   b) Trolley Coach - 41 passengers
   c) Articulated Bus - 55 passengers
   d) Orion (30-foot) Bus - 31 passengers
   e) Streetcar - 46 passengers
   f) Articulated Streetcar - 62 passengers;

3) there are no alternative transit services available in the area which could otherwise satisfy the specified travel need; and

4) the current first/last trip does not provide connections with the first or last subway train at the subway station it feeds.

If the cost-recovery condition plus two of the other three conditions are met, then the proposed trip(s) is/are recommended for implementation, subject to the availability of budgeted mileage.

6. PROPOSALS FOR IMPROVED FREQUENCY OF SERVICE ON EXISTING ROUTES

As described earlier in Section III.2, the ongoing Ridership Monitoring and Service Adjustment Program ensures that, subject to availability of resources, the levels of service provided on transit routes are commensurate with demonstrated passenger demand. Consequently, justifiable improvements in service levels on a given route will typically have already been

implemented or planned for implementation prior to the submission of such municipal proposals.

Nonetheless, when a municipality's Service Standards submission contains a proposal for improved frequency of service on an existing route, the most recent ridership information available for that route for the applicable operating period will be re-examined. If additional service is still warranted (as described in Section II.3.a), then an improvement in service may be recommended, subject to the availability of vehicles and budgeted mileage.

7. PROPOSALS FOR SPECIAL SERVICES

The vast majority of the Commission's operations consist of "regular services" which operate year-round on fixed routes, with vehicles providing "local" service (i.e. picking up and discharging passengers at all stops) along those routes, and using the regular integrated fare structure. "Special services", on the other hand, are those which do not conform to the above-noted characteristics of regular services; examples include express services, all-night transit services, the proposed Community Bus services, seasonal and/or temporary services, and services which operate with a separate and different fare structure.

All proposals for special services are automatically evaluated with respect to the underlying criteria of meeting public transportation needs in Metropolitan Toronto in an efficient and cost-effective manner. However, given that special services do not conform to the characteristics of regular

services, analysis of all such proposals requires the use of "special" or separate criteria and evaluation techniques. Municipal proposals for non-regular services which do not fall into any of these categories must conform to certain other Commission policies.

Methods for evaluating express and all-night service proposals are currently being developed.

In October 1982, a staff report concerning the proposed Community Bus Service program was submitted to the Commission for its consideration. Within that report, a set of proposed guidelines for the evaluation of municipal requests for such services was presented. However, primarily because of financial circumstances at that time, the Commission decided to take no action on the report and referred it to the Chief General Manager for use if and when required, as a result of a specific transit problem in a particular municipality.

Consequently, no formally-adopted guidelines for the evaluation of requests for Community Bus Services exist at the present time.

8. MISCELLANEOUS PROPOSALS

When a municipality's annual Service Standards submission contains a proposal which does not fall into any of the aforementioned categories, it is classified as a "miscellaneous

proposal". Since the introduction of the Service Standard Program in 1977, the miscellaneous proposals submitted by the area municipalities have related to many varied aspects of the Commission's operations, encompassing such diverse areas as commuter parking, modal interchange at subway stations, and fare structure.

Because of their unique nature, each of the miscellaneous proposals received each year is dealt with individually, in the most appropriate manner. Although the detailed evaluation of such proposals often occurs outside the formal Service Standards process itself, the results of the evaluation (or other background information) are presented in the Commission's subsequent Service Standards Application report.

PART V - SIX-MONTH REVIEW OF NEW AND MODIFIED SERVICES

After a recommended new service or service change has received the approval of the Commission and has been reviewed by the appropriate municipal council, it is implemented for a trial period of six months. During this trial period, ridership on the new service is monitored closely. At the end of six months, when ridership on the new service will generally have approached its "mature state", its performance is reviewed and a decision concerning its future is made.

In most cases, service changes which have been achieved at minimal cost (such as minor route extensions or the addition of an earlier or later individual trip on an existing route) do not require a detailed review. If the new service is found to be serving a ridership commensurate with the service level and route structure, it is deemed to be fulfilling a public need at no significant additional cost to the Commission. Unless its implementation has resulted in operational difficulties, its confirmation as a permanent service is usually recommended.

In contrast, new routes, major route extensions (i.e. those which require additional vehicles) and the provision of additional periods of operation on existing routes all are subjected to a more detailed review of ridership at the conclusion of the six-month trial period. The first step in this review is to compare actual ridership attributable to the new or modified service to the "mature state" ridership which had been projected for the service. If this actual ridership approximates

85 per cent of the projected "mature state" ridership, then the new or modified service is considered to be performing satisfactorily and may be recommended for confirmation as a permanent service. If the actual ridership is increasing at a slower rate than expected and has not yet reached 85 per cent of the projected "mature state" ridership, then a revised "mature state" ridership projection is developed, based on this lower actual observed ridership.

The new or modified service may be recommended for confirmation as permanent if, using the revised ridership projection, the following conditions apply:

1) the revised overall ranking of a new route or major route extension in the previous year's Comparative Evaluation would still justify its implementation; or
2) the revenue which would be generated during a new period of operation on an existing route (when "mature") would cover at least 68 per cent of the total operating costs incurred in providing the additional period of service (as specified in section IV.4 above).

If the new or modified service fails to meet either of the above two ridership and economic conditions, then the service (in its present form) may not be an efficient and cost-effective use of resources. In such cases, staff may recommend service modifications which might improve the new or modified service's performance. If no such modification can be found, the Commission is under no obligation to confirm the service as permanent and may cancel it.

The results of the six-month evaluation of each year's recommended Service Standards Program service changes are usually contained in the following year's Service Standards Application report. After this initial six-month review, all such services are thereafter evaluated regularly through the Ridership Monitoring and Service Adjustment Program and the Annual Performance Review.

PART VI - CONTINUED DEVELOPMENT OF THE SERVICE STANDARDS PROGRAM

It is intended that the Service Standards Program will continue to evolve, in response to changes which are occurring in the demand for transit, urban development patterns, demographic trends, etc. within Metropolitan Toronto. Consequently, new editions of the Base Document will be published, documenting all subsequent revisions to the program.

Specifically, prior to the publication of the next edition of this Base Document, the following subject areas will be investigated for possible inclusion in the program:

1) express services
2) all-night services
3) productivity measures
4) operating speed
5) clockface schedules and headways
6) service reliability
7) unscheduled short-turning
8) layover time
9) timed transfers
10) amalgamation of routes
11) regular evaluation of existing all-night services
12) restructuring of routes (i.e. through introduction of new scheduled short turns)
13) "permanent" route diversions.

APPENDICES

APPENDIX A - CALCULATION OF THE FIVE MEASURES USED IN COMPARATIVE EVALUATION

1) Change in Accessibility Measurement Factor (AMF):

Accessibility to transit is defined as the time it takes a resident to access transit service, consisting of actual walking time to the bus stop and waiting time at the bus stop. It is measured by means of a computer program which calculates the minimum transit access time for existing and potential patrons, at the block-face level, to all nearby relevant routes. The Accessibility Measurement Factor (AMF) is expressed as the aggregate transit accessibility (person-minutes) for all the residents (or workers) of the route's catchment area divided by the total number of residents (or workers) within the catchment area, thus yielding an average access time for each resident (worker) of that catchment area. The set of all block-faces for which a given route has the minimum transit access times is defined as the catchment area for that route. The AMF values are calculated for both the situation with the route in operation and the situation without the route in operation. The change in Accessibility Measurement Factor is the difference in average access time between the with-service and without-service situations.

2) Change in Aggregate Accessibility per Weekday Cost:

The change in aggregate accessibility is the difference between the total person-minutes for the catchment area for the with-service situation and the total person-minutes for the catchment area in the without-service situation. Weekday marginal cost for the service is then determined, and the change in aggregate accessibility per weekday cost is the dividend of these two respective measures.

3) New Ridership per Weekday Cost:

Total transit ridership for the route's catchment area is first projected or, in the case of an existing route, recorded through a ridership count. Net new ridership for new routes is then obtained by subtracting, from the projected total ridership for the catchment area, the ridership already occurring at other existing service stops within the catchment area. Similarly, new ridership for existing services is determined by subtracting, from the recorded existing total ridership within the catchment area, the proportion of ridership which is relatively proximate to other services and which, therefore, was probably originally diverted from those other services when the route was instituted. The applicable net new ridership figure is then divided by the weekday marginal cost for the service.

4) Marginal Revenue/Cost Ratio:

Marginal revenue for the route is projected and then allocated on a per-mile basis. The cost per mile is the marginal cost, allocated on a per-mile basis. The marginal revenue/cost ratio is the dividend of these two measurements.

5) Transit Dependency:

This measure is derived from Regional Planning File information regarding households and driver participation rates. A measure is derived which indicates the proportion of people within each block, and then within the catchment area, which does not have access to an automobile for travel and which, therefore, is dependent on transit.

NOTE: More detailed information on the calculation of the above five measures is available from Commission staff on request.

APPENDIX B - RIDERSHIP FORECASTING FOR ADDITIONAL PERIODS OF OPERATION ON EXISTING ROUTES

The following established ridership ratios are used to estimate potential ridership during new operating periods on existing routes:

1-a) For routes serving residential and mixed-use areas, weekday midday ridership is approximately equal to 54% of combined A.M. and P.M. Peak ridership;

1-b) For routes serving predominantly industrial areas, weekday midday ridership is approximately equal to 36% of combined A.M. and P.M. Peak ridership;

2) Saturday daytime ridership is approximately equal to 36% of weekday total ridership;

3) weekday evening ridership is approximately equal to 33% of weekday midday ridership;

4) Saturday total ridership is approximately equal to 50% of weekday total ridership; and

5) Sunday or Holiday total ridership is approximately equal to 25% of total weekday ridership.

Form 801/740/May 82

TORONTO TRANSIT COMMISSION

MEETING DATE JUNE 12, 1984

DATE JUNE 5, 1984 REPORT NO. 7

SUBJECT SERVICE STANDARDS PROGRAM - REVISED BASE DOCUMENT

RECOMMENDATION

It is recommended that:

1. the Commission approve the attached Service Standards Base Document; and

2. the approved Service Standards Base Document be forwarded to the local municipalities within Metropolitan Toronto, the Municipality of Metropolitan Toronto, and the Ministry of Transportation and Communications for information.

(A.H.S.) (J.P.)

HISTORY

At its meeting of April 19, 1983, the Commission approved in principle the March 1983 draft report entitled "The Service Evaluation Program" and agreed to forward the draft report to the local municipalities for comment. The attached revised "Base Document" reflects the comments and concerns of the local municipalities, plus further refinements to the program developed during the 1983 Service Standards Application.

DISCUSSION

The revised report differs from the March 1983 document in the following areas:

1. The guidelines for the direct municipal subsidy of poor performing routes have been deleted because the local municipalities felt that transit funding should remain a Metropolitan responsibility;

2. The proposed evaluation criteria and subsidization guidelines for Community bus services have been withdrawn (although the concept received some support, the municipalities were unwilling to directly subsidize such services);

SERVICE STANDARDS PROGRAM -
REVISED BASE DOCUMENT

3. Proposed evaluation criteria for express services and all-night services have been withdrawn pending the completion of on-going comprehensive studies of these subjects;

4. Loading standards for streetcars have been revised to include ALRVs and to differentiate between private right-of-way and mixed traffic operation;

5. The proposed change of the name of the Service Standards Program to the "Service Evaluation Program" has been withdrawn because of the strong municipal support for the process under the original title.

It should be noted that the attached report is an interim document. Current research studies are underway to improve the overall Service Standards process and to provide appropriate policies for inclusion in subsequent additions of the "Base Document". Specifically, warrants are under development for express and all-night services and methods are being developed to ensure that different types of service change proposals are evaluated fairly and consistently.

JUSTIFICATION

The revised Service Standards Program "Base Document" describes the methods currently being applied to the 1984 Service Standards Application. The availability of an up-to-date document describing the process will encourage the continued municipal support for the Service Standards program.

11-109-71

Attached Hereto: Base Document